PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
C10M 173/02 // (C10M 173/02, 125:10, 125:20, 133:06, 133:08), C10N 30:12, 30:16, 40:00

A1

(11) International Publication Number: **WO 95/26389**

(43) International Publication Date: 5 October 1995 (05.10.95)

(21) International Application Number: PCT/CA95/00156

(22) International Filing Date: 21 March 1995 (21.03.95)

(30) Priority Data:
217,978 25 March 1994 (25.03.94) US

(71) Applicant: DIVERSEY CORPORATION [CA/CA]; Suite 1600, 1 Robert Speck Parkway, Mississauga, Ontario L4Z 3S9 (CA).

(72) Inventor: REMUS, Christian, A.; 14574 Warwick, Detroit, MI 48223 (US).

(74) Agent: WOODLEY, John, H.; Sim & McBurney, Suite 701, 330 University Avenue, Toronto, Ontario M5G 1R7 (US).

(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).

Published
With international search report.

(54) Title: ALKALINE DIAMINE TRACK LUBRICANTS

(57) Abstract

Alkaline diamine track lubricants for use with glass, aluminum and two-piece PET containers and other articles of manufacture are prepared from an admixture of an alkyl diamine and a water-soluble hydrotrope. The diamine lubricants are prepared without the neutralization thereof and have a corrosion inhibitor which is, preferably, a reducing agent and a biocide incorporated therein to. A source of alkalinity may be employed, as well, to maintain the pH above 8.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GB**	United Kingdom	**MR**	Mauritania
AU	Australia	**GE**	Georgia	**MW**	Malawi
BB	Barbados	**GN**	Guinea	**NE**	Niger
BE	Belgium	**GR**	Greece	**NL**	Netherlands
BF	Burkina Faso	**HU**	Hungary	**NO**	Norway
BG	Bulgaria	**IE**	Ireland	**NZ**	New Zealand
BJ	Benin	**IT**	Italy	**PL**	Poland
BR	Brazil	**JP**	Japan	**PT**	Portugal
BY	Belarus	**KE**	Kenya	**RO**	Romania
CA	Canada	**KG**	Kyrgystan	**RU**	Russian Federation
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CG	Congo			**SE**	Sweden
CH	Switzerland	**KR**	Republic of Korea	**SI**	Slovenia
CI	Côte d'Ivoire	**KZ**	Kazakhstan	**SK**	Slovakia
CM	Cameroon	**LI**	Liechtenstein	**SN**	Senegal
CN	China	**LK**	Sri Lanka	**TD**	Chad
CS	Czechoslovakia	**LU**	Luxembourg	**TG**	Togo
CZ	Czech Republic	**LV**	Latvia	**TJ**	Tajikistan
DE	Germany	**MC**	Monaco	**TT**	Trinidad and Tobago
DK	Denmark	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**US**	United States of America
FI	Finland	**ML**	Mali	**UZ**	Uzbekistan
FR	France	**MN**	Mongolia	**VN**	Viet Nam
GA	Gabon				

ALKALINE DIAMINE TRACK LUBRICANTS

FIELD OF THE INVENTION

The present invention relates to diamine lubricant compositions. More particularly, the present invention relates to highly alkaline diamine track lubricant compositions. Even more particularly, the present invention relates to highly alkaline alkyl diamine track lubricant compositions which contain biocides and/or corrosion inhibitors.

BACKGROUND OF THE INVENTION

Amines have been used extensively in various types of lubricants and stress crack inhibition in PET articles. Weber, United States patent 5,062,978, describes aqueous lubricant compositions which include a particular group of fatty alkyl amines. The fatty alkyl amines are neutralized with acids to adjust the pH of the solution to within the neutral range of pH 5 to 8. The composition may also include dispersing agents and dissolving agents for the amine lubricant. In addition, solubilizers may be used, such as isopropanol, ethanol and glycols. The dispersing agents may be triethanol amine and alkoxylated fatty alkyl monoamines and diamines. Weber requires that, in order to improve the solubility of the selected fatty alkyl amines, acids which form pH neutral salts with the amines may be added to the lubricant composition where organic acids are the preferred acids for use in neutralizing the amines.

United States patent 5,244,589 describes an antimicrobial lubricant which is fatty acid based and includes a quaternary ammonium salt as the antimicrobial. A sufficient amount of alkaline material is added to the composition to increase the pH to at least 8. Optionally an amine may be included in the composition to significantly enhance antimicrobial and lubricating properties of the composition. Suitable amines include monoamines and diamines, such as secondary amines. Corrosion protection agents are also described as being

useful in conjunction with this fatty acid based lubricant. As is understood by those skilled in the art, fatty based lubricants are distinct from synthetic diamine lubricants where fatty acid based lubricants have a source of alkalinity incorporated therein in order to form soaps at the pH.

United States patents, 5,009,801, 5.073,280 and 5,223,162, all commonly owned by the applicant of this application, describe the use of amines in stress crack inhibition compositions for use in preventing stress cracking in PET articles. United States patent 5,009,801 describes the use of a fatty acid based lubricant which carries the stress crack inhibitor. The fatty acid is saponified with an alkali metal hydroxide or free base amines, such as primary, secondary and tertiary amines. The stress crack inhibitor is a hydrophilic-substituted aromatic hydrocarbon having either an alkyl or an aryl side chain. The saponifying agent for neutralizing the fatty acid is preferably an amine rather than the use of potassium hydroxide or the like, because it is generally understood that potassium hydroxide contributes to and promotes stress cracking in PET articles.

United States patent 5,073,280 describes a stress crack inhibition composition which uses an amine of greater than six carbon atoms as the stress crack inhibitor. The stress crack inhibitor may be applied directly to the PET article through a fatty acid lube or may be included in the contents of the container. The selected amine is preferably a neutral amine. The fatty acid has been neutralized with a base. It is has been found that, by using amines of greater than six carbon atoms as a stress crack inhibitor, the fatty acid may be neutralized with potassium hydroxide without causing stress cracking in the PET articles. The amines may be primary, secondary or tertiary amines. The secondary amines may be, for example, hydrogenated tallow diamine, oleyl diamines and the like.

United States patent 5,223,162 describes a washing composition which includes a hydrophilic-substituted aromatic hydrocarbon having either alkyl or aryl side chain for use in inhibiting stress cracking. The washing composition is a caustic solution where the presence of the hydrophilic-substituted aromatic hydrocarbon has been found to reduce stress cracking during the washing operation. Optionally amines may be used to enhance the stress crack inhibition properties of the hydrophilic-substituted aromatic hydrocarbons. Such amines may be primary, secondary or tertiary amines along with other amines such as alkoxylated amines.

Although amines have been used in a variety of lubricating compositions and stress crack inhibition compositions, no attempt has been made to use amines in a distinct synthetic diamine lubricant composition.

As is known to those skilled in the art to which the present invention pertains, aqueous use solutions of alkyl diamine track lubricants have a tendency to rust mild steel and to create and deposit an unsightly black soil or sludge, especially around brewery or other beverage product fillers. Moreover, such lubricants do not achieve the optimally desired biocidal levels.

Thus, it is to be appreciated that a major advance in the art would be achieved if there existed an alkyl diamine track lubricant which minimized rusting of mild steel tracks and sludge creation, while exhibiting enhanced biocidal activity. It is to this to which the present invention is directed.

SUMMARY OF THE INVENTION

According to the present invention, there is provided improved highly alkaline alkyl diamine lubricants made from lubricant concentrates which are free of fatty acids and prepared by admixing with the diamine a water-soluble hydrotrope for the diamine.

Preferably, the water-soluble hydrotrope is an ethoxylated hydrotrope. By using the ethoxylated hydrotrope, the diamine is solubilized into solution due to the emulsifying nature of the hydrotrope. Likewise the hydrotrope enables the introduction of quaternary ammonium-type biocides into both the concentrate and use solution.

The present concentrate further includes a corrosion inhibitor. Preferably, the corrosion inhibitor is also a reducing agent. Useful corrosion inhibitors which also are reducing agents include sodium nitrite, sodium thiosulfate, sodium metabisulfate and the like, as well as mixture thereof. Other useful corrosion inhibitors, although not reducing agents, include mercaptobenzo-thiazole, sodium benzoate and the like, as well as mixtures thereof.

Suitable biocides which may be included are the quaternary ammonium-type compounds.

A source of alkalinity is also included to raise the pH levels of the use solution to the desired range. In accordance herewith the diamine component is not neutralized.

The lubricants prepared from the concentrate are highly alkaline having a pH $\geq$ 8.0 and preferably a pH of from between about pH 9.0 to about pH 13.0.

The use solutions are prepared by admixing the concentrate with water. Generally, the use solution contains one part of concentrate per about 1/100 to about 1/1000 part of water.

While the present compositions do not inhibit stress cracking, they do minimize rusting of mild steel conveyors and considerably reduce black soil formation while permitting the introduction of a biocide thereinto.

In accordance with an aspect of the invention, a diamine-based track lubricant, free of fatty acid, comprises;

(a) an alkyl diamine,

(b) a water-soluble hydrotrope selected from the group consisting of ethoxylated alkyl amines, having at least 6 carbon atoms in the alkyl portion, nonionic surfactants and mixtures thereof,

(c) a source of alkalinity,

(d) a corrosion inhibitor,

(e) water, and

wherein the lubricant has a pH greater than 8 and the diamine is not neutralized.

In accordance with another aspect of the invention, a diamine track lubricant concentrate, free of fatty acid, comprises:

(a) an alkyl diamine,

(b) a water-soluble hydrotrope selected form the group consisting of ethoxylated alkyl amines having at least 6 carbon atoms in the alkyl portion, nonionic surfactants and mixtures thereof,

(c) a water-soluble reducing agent,

(d) water, and

wherein the diamine is not neutralized, and the concentrate has a pH between about 11.5 to about 13.0.

For a more complete understanding of the present invention reference is made to the following detailed description and accompanying examples.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the present invention, there is provided an alkyl diamine track lubricant having a pH greater than 8, which generally comprises:

(a) a diamine lubricant

(b) a water-soluble hydrotrope,

(c) a corrosion inhibitor;

(d) a source of alkalinity, and

(e) water.

A biocide may also be included herewith.

The lubricant is prepared from a lubricant concentrate generally comprising by weight:

(a) from bout 0.5 to about 15 percent of the diamine,

(b) from about 1 to about 30 percent of the hydrotrope, and

(c) from about 0 to about 15 percent of the biocide,

(d) from about 1 to about 15 percent of the corrosion inhibitor.

(e) an effective amount of the source of alkalinity sufficient to raise the pH of the use solution to a pH $\geq$ 8, and

(f) the balance being water.

Preferably the concentrate comprises:

(a) from about 1 to about 10 percent of the diamine,

(b) from about 4 to about 20 percent of the hydrotrope,

(c) from about 1 to about 10 percent of the biocide,

(d) from about 5 to about 10 percent of the reducing corrosion inhibitor,

(e) from about 0.5 to about to 1.0 percent of the source of alkalinity, and

(f) the balance being water.

The lubricant is prepared by diluting the concentrate with water in a volumetric ratio of concentrate to water ranging from about 1/100 to about 1/1000 and, preferably, from about 1/200 to about 1/800.

Heretofore, and as shown in the prior art, diamine lubricants have been neutralized with a weak acid, such as acetic acid or the like. Herein, no such neutralization occurs. Rather, the unneutralized diamine, which is alkaline, is emulsified into aqueous solution using the water-soluble hydrotrope. It is noteworthy that, traditionally, with synthetic amine lubricants, that the diamine lubricants are insoluble in water. Therefore, the use of the water-soluble

hydrotrope enables the formation of a water-soluble lubricant having a pH greater than 8. The diamine lubricants, in accordance with this invention, are to be distinguished from fatty acid lubricants. Fatty acid lubricants require the use of alkaline materials to form soaps which are avoided with diamine lubricants as will be subsequently described. Diamine lubricants when free of fatty acid lubricants are usually not affected by water hardness. This is a significant benefit in making the synthetic diamine formulation, because hard water sequestrants, chelators and the like are not required in the composition. Although it is understood that the diamine composition, in accordance with this invention, may include other additives, it is also understood that the diamine composition may only include the basic ingredients of a hydrotrope corrosion inhibitor, source of alkalinity and water in combination with the selected diamine. Such a compact formulation has surprising results insofar as achieving effective lubricating properties.

The oil-soluble diamines used herein are, preferably primary amines having an alkylene residue which may be straight chain or branched, containing from 8 to 24 carbon atoms and preferably, 10 to 18 carbon atoms. Preferably, the alkylene group further contains unsaturation.

Preferably, the fatty alkyl diamines used herein generally correspond to the formula:

$$R_1 - NH - R_2 - NH_2$$

wherein R_1 and R_2 are each linear alkyl, R_1 being a C_8 to C_{24} alkyl and R_2 being a C_1 to C_3 alkyl group. Examples of suitable diamines are oleyldiamine, cocodiamine, myristyl diamine, linoeyldiamine, strearyldiamine, 2-ethyldodecane diamine, and the like. Mixtures of diamines may be used.

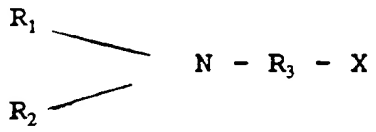
The diamines contemplated for use herein are available from several commercial sources, such as the oleyldiamine from Witco Chemical, sold under the name ANDOGEN® 572.

Typically, the diamine is present in the use solution as a free base diamine.

Any water-soluble hydrotrope which can hydrotrope the diamine can be used herein. Among the useful hydrotropes are, preferably, alkoxylated amines and nonionic surfactants. The amines may be alkoxylated monoamines, diamines, triamines, tetraamines, pentaamines and the like. These amines may be substituted or unsubstituted. While these amines may contain other alkoxylates, they must contain sufficient moles of ethylene oxide to enable the hydrotroping of the diamine into the aqueous system.

Generally, the ethoxylated amine hydrotrope in an alkyl amine having at least six carbon atoms in the alkyl portion. The amine may be a primary, a secondary and/or a tertiary amine.

The alkoxylated alkyl amines which can be employed in this invention have the general formula:



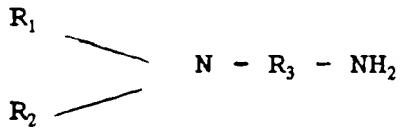
wherein R_1 and R_2 are either hydrogen, alkoxylate, or alkyl, R_3 is an unsubstituted linear alkyl group having from 6 to 12 carbon atoms, and, preferably from 6 to 10 carbon atoms and X is an alkoxylate group.

Preferably, the hydrotrope is an oxyalkylated amine selected from the group consisting of oxyalkylated N-alkylamines and oxyalkylated N-alkyl-alkylenediamines. Examples of oxyalklated N-alkylamines are the oxyalkylated fatty amines such as oxyalkylated N-cocoamine, N-stearylamine, N-palmitylamine, and the like.

The N-alkyl group should have from 8 to about 24 carbon atoms, preferably 12 to 20 carbon atoms, and more preferably, 15 to 18 carbon atoms. This group may be unsaturated, having from 1 to 4 sites of unsaturation, preferably 1 to 2 sites of unsaturation. Such amines correspond to the formula: R - NHC where R is a C_{18} to C_{24} alkyl or alkenyl group.

The polyoxyalkylene ether portion of the oxyalkylated N-alkylamine is preferably derived completely from the ethylene oxide, and is thus a polyoxyethylated N-alkylamine. However, block and heteric polyoxyethylene/polyoxypropylene copolymeric N-alkylamines are also suitable, particularly, those block copolymers having an internal polyoxyethylene block capped with a polyoxypropylene block. Use of other alkylene oxides such as butylene oxide, amylene oxide, and the higher alkylene oxides such as the VIKOLOX® alkylene oxides having from 8 to 18 carbon atoms in the alkylene residue are also suitable. If alkylene oxides with a C_8 or greater alkylene residue are used, then not more than about 4 moles of said alkylene oxide, preferably 2 moles should be used, as a cap. Preferably, the oxyalkylation is performed with substantially all ethylene oxide. From 6 to about 40 moles, preferably from 10 to about 30 moles, and most preferably, from 12 to about 16 moles of ethylene oxide should be used.

The N-alkyl-alkylenediamines correspond to the formula:



These are oxyalkylated preferably in the same manner as the oxyalkylated N-alkylamines, i.e., under suitable oxyalkylation conditions known to the skilled artisan. R_1 is preferably a C_8 to C_{20} linear or branched alkyl group,

optionally containing unsaturation, more preferably a C_{12} to C_{18} alkyl, and most preferably C_{15} to C_{18} alkyl. R_2 is an alkylene residue containing from 2 to 6 carbon atoms, preferably 3 to 6 carbon atoms, for example 1,3-propylene, 1,4-butylene, 1,5-pentylene, or 1,6-hexylene (1,6-hexamethylene). Most preferably R_2 is trimethylene, R_1 is C_{13} to C_{15}, and the oxyalkylation is all ethylene oxide derived. A suitable oxyalkylated N-alkyl alkylenediamine is SYNPROLAM® 35 3Nx10, available from Imperial Chemical Inc. (ICI).

Among the useful alkoxylated amines are the ethoxylated amines such as, for example, oleyl (ethoxylated) amine, tallow (ethoxylated) amine, coconut (ethoxylated) amine, as well as mixtures thereof. These compounds are well known and commercially available.

As noted hereinabove, the amine hydrotrope is employed as the free-base amine.

In many instances, the present alkoxylated amine hydrotropes may be defined classically as nonionic surfactants, depending on the degree of alkoxylation. However, it is not essential to the present invention that the ethoxylated amine be a nonionic surfactant, only that is be capable of hydrotroping the diamine. Moreover, the diamines are optimally employed herein because of their compatibility with the biocides.

Another useful class of hydrotropes are the well-known and commercially available water-soluble nonionic surfactants.

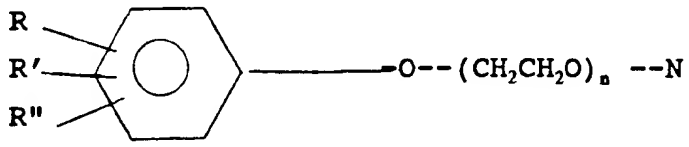
The nonionic surfactants which are advantageously employed in the compositions of the present invention are basically the polyoxyalkylene adducts of hydrophobic bases wherein the oxyalkylene portion of the molecule includes ethylene oxide, butadiene dioxide and glycidol, mixtures of these alkylene oxides with each other and with minor amounts of propylene oxide, butylene oxide, amylene oxide, styrene oxide, and other higher molecular weight alkylene oxides. Ethylene oxide, for example, is

condensed with the hydrophobic base in an amount sufficient to impart water dispersibility or solubility and surface active properties to the molecule being prepared. The exact amount of ethylene oxide condensed with the hydrophobic base will depend upon the chemical characteristics of the base employed and is readily apparent to those of ordinary skill in the art relating to the synthesis of oxyalkylene surfactant condensates. Typical hydrophobic bases which can be condensed with ethylene oxide in order to prepare nonionic surface active agents include mono- and polyalkylphenolx, polyoxypropylene condensed with a base having from about 1 to 6 carbon atoms and at least one reactive hydrogen atom, fatty acids, fatty amines, other than those enumerated above, fatty amides and fatty alcohols. The hydrocarbon ethers such as the benzyl or lower alkyl ether of the polyoxyethyelne surfactant condensates are also advantageously employed in the compositions of the invention.

Among the suitable nonionic surface active agents are the polyoxyethylene condensates of alkylphenols having from about 6 to 20 carbon atoms in the alkyl portion and from about 5 to 15 ethenoxy groups in the polyoxyethylene radical. The alkyl substituent on the aromatic nucleus may be octyl, diamyl, n-dodecyl, polymerized propylene such a propylene tetramer and trimer, isoctyl, nonyl, etc. The benzyl ethers of the polyoxyethylene condensates of monoalkyl phenols impart good properties to the compositions of the invention. A typical product corresponds to the formula:

$$C_{18}H_{17}-O-(OCH_2CH_2)_{15}OCH_2C_6H_5$$

Higher polyalkyloxyethylated phenols corresponding to the formula:



wherein R is hydrogen or an alkyl radical having from about 1 to 12 carbon atoms, R′ and R" are alkyl radicals having from about 6 to 16 carbon atoms and n has a value from about 10 to 40, are also suitable as nonionic surfactants. A typical oxyethylated polyalkylphenol is dinonylphenol condensed with 14 moles of ethylene oxide.

Other suitable nonionic surface active agents are cogeneric mixtures of conjugated polyoxyalkylene compounds containing in their structure at least one hydrophobic oxyalkylene chain.

Polymers of oxyalkylene groups obtained from propylene oxide, butylene oxide, amylene oxide, styrene oxide, mixtures of such oxyalkylene groups with each other and with minor amounts of polyoxyalkylene groups obtained from ethylene oxide, butadiene dioxide and glycidol are illustrative of hydrophobic oxyalkylene chains. Polymers of oxyalkylene groups obtained from ethylene oxide, butadiene dioxide, glycidol, mixtures of such oxyalkylene groups with each other and with minor amounts of oxyalkylene groups obtained from propylene oxide, butylene oxide, amylene oxide, and styrene oxide are illustrative of hydrophilic oxyalkylene chains.

Further suitable nonionic surface active agents are the polyoxyethylene esters of higher fatty acids having from about 8 to 22 carbon atoms in the acyl group and from 8 to 15 ethanoxy units in the oxyethylene portion.

Typical products are the polyoxyethylene adducts of tall oil, rosin acids, lauric, stearic and oleic acids and the like. Additional, nonionic surface active agents are the polyoxyethylene condensates of higher fatty acid amines and amides having from about 8 to 22 carbon atoms in the fatty alkyl or acyl group and about 10 to 15

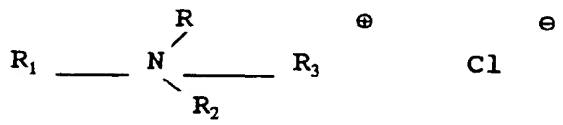
ethanoxy units in the oxyethylene portion. Illustrative products are coconut oil, fatty acid amines and amides condensed with about 10 to 15 moles of ethylene oxide.

Other suitable polyoxyalkylene nonionic surface active agents are the alkylene oxide adducts of higher aliphatic alcohols and thioalcohols having from about 8 to 22 carbon atoms in the aliphatic portion and about 3 to 15 carbon atoms in the oxyalkylene portion. Typical products are the synthetic fatty alcohols, such as n-decyl, n-undecyl, n-dodecyl, n-tridecyl, n-tetradecyl, n-hexadecyl, n-octadecyl and mixtures thereof condensed with 3 to 15 moles of ethylene oxide, a mixture of normal fatty alcohols condensed with 9 to 20 moles of ethylene oxide and 3 to 10 moles of propylene oxide, in either order, or a mixture of normal fatty alcohols condensed with a mixture of propylene and ethylene oxides, or a linear secondary alcohol condensed with 3 to 10 moles of ethylene oxide, or a linear secondary alcohol condensed with a mixture of propylene and ethylene oxides, or a linear secondary alcohol condensed with a mixture of ethylene, propylene and higher alkylene oxides.

As noted, these surfactants are well known and commercially available such as those sold by BASF under the name PLURONIC and TETRONIC, as well as those sold by Union Carbide under the name TERGITOL.

Generally, the hydrotrope and diamine are present in respective weight ratio of about 2:1.

The biocide which may be included herewith is, preferably, a quaternary ammonium chloride-type biocide well known to the skilled artisan and which, generally corresponds to the formula:



wherein R, R_1, R_2 and R_3 are each, individually, selected from the group of hydrogen, C_1 to C_{12} alkyl groups, or aryl.

The composition hereof also includes a corrosion inhibitor which preferably is a reducing agent as well. The corrosion inhibitor minimizes the rusting of a mild stainless steel or plastic track conveyor. Although not as efficacious as a reducing agent-corrosion inhibitor, other corrosion inhibitors may be used herein. Among the useful compounds are sodium nitrate, sodium thiosulfate, sodium bisulfate, mercaptobenzothiozale, sodium benzoate, substituted imidazoline derivatives including the substituted imidazoline of coco fatty acid and the like. Mixtures of corrosion inhibitor-reducing agents may be used. Preferably, sodium nitrite is employed since it is both a reducing agent and corrosion inhibitor. It has been observed that the presence of the nitrite in the present lubricant precludes the rusting and the formation of black soil or sludge heretofore encountered in breweries.

The source of alkalinity is used to elevate the pH of the lubricant to the desired levels and contributes to the cleaning. Although not wishing to be bound by any theory, it is believed that by raising the pH to the elevated levels contemplated herein rust prevention and soil prevention is enhanced. Also, it is believed that the elevated pH keeps the diamine in the insoluble free base state, thereby minimizing its contribution to oxidation reactions.

Any source of compatible alkalinity may be used such as carbonates, metasilicates, bicarbonates, hydroxides and the like, as well as mixtures thereof, may be used. Preferably, a strong base such as sodium hydroxide, potassium hydroxide, etc., or the like is employed as the alkaline source. It should be noted that in selecting the diamine and an amine hydrotrope, optimally, the alkyl

portion of the diamine has about the same carbon chain length as the alkyl portion of the amine.

Generally, the concentrate has a pH of from about 11.0 to about 13.0.

Also, and as noted above, the present track lubricants are particularly useful on mild steel stainless steel, plastic track conveyors, such as are used for filling glass, aluminum and two-piece PET containers.

The lubricant use solutions hereof, which are advantageously supplied in the form of concentrates which are subsequently, preferably, diluted with water for use, also may contain additional ingredients such as defoamers, algaecides, etc., which may either be incorporated into the concentrate or added to the use solution.

In preparing the diamine lubricant concentrate hereof, the components are admixed together. Ordinarily, the water is warmed to about 100°F to about 130°F and the other ingredients are added thereto. In preparing the use solution, the concentrate is added to the requisite amount of water, usually, at room temperature.

The lubricant composition according to this invention is not, under ordinary conditions, affected by water hardness. Consequently, water softeners, which are usually employed with fatty acid-type soap lubricants, are not necessary for the diamine lubricants hereof. As noted, the use solution has a pH $\geq$ 8 and, usually, ranging from about 9.0 to about 13.0, and, preferably, from about 10.0 to about 11.5.

For a more complete understanding of the present invention, reference is made to the following non-limiting examples. In the examples, which are to be construed as illustrative, rather than limitative, of the present invention, all parts are by weight absent indications to the contrary.

EXAMPLE 1

This example illustrates the preparation of a diamine lubricant concentrate in accordance with the present invention.

Into a suitable container equipped with stirring means and at ambient temperatures is mixed the following:

Ingredient	Amt, pbw
Diamine[1]	5.0
Water-Soluble Amine Hydrotrope[2]	10.0
Quaternary Ammonium Compound[3]	9.0
Potassium Hydroxide, 45%	0.6
Sodium Nitrite	5.0
Water	70.4

[1] an alkyl diamine sold by Witco Chemical under the name Adogen 572

[2] an alkyl (ethoxylated) amine sold by Witco Chemical under the name Varonic K215

[3] a commercially available product sold by Stepan Chemical under the name BTC 2125

EXAMPLE II

Following the procedure of Example I, a diamine lubricant concentrate, in accordance with the present invention, is prepared from the following:

Ingredient	Amount, pbw
Diamine[1]	5.0
Water-Soluble Amine Hydrotrope[2]	10.0
Potassium Hydroxide, 45%	0.6
Sodium Nitrite	9.9
Water	74.5

[1] Same as Ex. I

[2] Same as Ex. I

EXAMPLE III

Following the procedure of Example I, a diamine lubricant concentrate was prepared from the following:

Ingredient	Amount, pbw
Diamine[1]	3.0
Nonionic Surfactant[2]	16.0
KOH, 45%	0.5
Sodium Nitrite	1.0
Water	79.5

[1] Same as Ex. I

[2] an ethoxylated nonylphenol sold by Union Carbide under the name Tergitol NP-9.

EXAMPLE IV

To test the efficacy of the present invention on corrosion inhibition and sludge formation, a 0.25% use solution is prepared by admixing 25 parts of the concentrate of Example II with 1000 parts of water in a suitable container and at room temperature.

A 1" x 3" 1010 carbon steel coupon is then immersed in the lubricant such that approximately one half of the coupon is immersed in the lubricant and the other half is in the atmosphere.

The coupon is then visually observed for rusting. After 21 days in the lubricant no rusting is visually apparent.

EXAMPLE V

Example III is repeated except that 40 parts of beer is added to the 160 parts of the 0.25% lubricant use solution.

After 5 days neither rusting nor sludge is observed on the coupons immersed in the lubricant.

From the above it is to be seen that by using water-soluble hydrotropes and, in particular, ethoxylated amines and/or nonionic surfactants, alkaline diamine lubricants are provided which can be used on various containers and articles with a lessening of corrosivity, while providing excellent lubricity, cleaning and the like.

Although preferred embodiments of the invention are described herein in detail, it will be understood by those skilled in the art that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

CLAIMS

1. A diamine-based track lubricant, free of fatty acid, comprising;

(a) an alkyl diamine,

(b) a water-soluble hydrotrope selected from the group consisting of ethoxylated alkyl amines, having at least 6 carbon atoms in the alkyl portion, nonionic surfactants and mixtures thereof,

(c) a source of alkalinity,

(d) a corrosion inhibitor,

(e) water, and

wherein the lubricant has a pH greater than 8 and the diamine is not neutralized.

2. The lubricant of claim 1 which further comprises: a quaternary ammonium biocide.

3. The lubricant of claim 1 wherein: the water-soluble amine is selected from the group consisting of coconut (ethoxylated) amine, oleyl (ethoxylated) amine, tallow (ethoxylated) amine and mixtures thereof.

4. The lubricant of claim 1 wherein: the hydrotrope is the amine, the amine being present as a free-base amine.

5. The lubricant of claim 1 wherein the hydrotrope and diamine are present in a respective weight ratio of about 2:1.

6. The lubricant of claim 1 wherein the corrosion inhibitor is a reducing agent.

7. A diamine track lubricant concentrate, free of fatty acid, comprising:

(a) an alkyl diamine,

(b) a water-soluble hydrotrope selected form the group consisting of ethoxylated alkyl amines having at least 6 carbon atoms in the alkyl portion, nonionic surfactants and mixtures thereof,

(c) a water-soluble reducing agent,

(d) water, and

wherein the diamine is not neutralized, and the concentrate has a pH between about 11.5 to about 13.0.

8. A concentrate of claim 7, which further comprises:

a source of alkalinity, the source of alkalinity being present in sufficient amount such that a use solution prepared therefrom has a pH greater than 8.

9. The concentrate of claim 7 which further comprises:

a quaternary ammonium chloride biocide.

10. The lubricant concentrate of claim 7 which further comprises, by weight:

(a) from about 0.5 to about 15 percent of the diamine;

(b) from about 1 to about 30 percent of the hydrotrope;

(c) from about 1 to about 15 percent of the reducing agent;

(d) an effective amount of the source of alkalinity sufficient to raise the pH of a lubricant prepared therefrom to a pH greater than 8;

(e) from about 0 to about 15 percent of a biocide, and

(f) the balance being water.

11. The concentrate of claim 10 wherein:

the hydrotrope is an ethoxylated alkyl amine having at least 6 carbon atoms in the alkyl portion.

12. the concentrate of claim 11 wherein:

the hydrotrope is selected from the group consisting of coconut (ethoxylated) amine, oleyl (ethoxylated) amine, tallow (ethoxylated) amine and mixtures thereof.

13. The concentrate of claim 12 wherein:

the hydrotrope and diamine are present in a respective weight ratio of about 2:1.

14. The concentrate of claim 7 wherein:

the hydrotrope and diamine are present in a respective weight ratio of about 2:1.

15. A diamine track lubricant comprising:

(a) water, and

(b) the concentrate of claim 13, the lubricant comprising one part by weight of the concentrate per about 100 to about 1000 parts by weight of water.

INTERNATIONAL SEARCH REPORT

Inte. ional Application No
PCT/CA 95/00156

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C10M173/02 //(C10M173/02,125:10,125:20,133:06,133:08), C10N30:12,C10N30:16,C10N40:00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C10M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP-A-0 372 628 (AKZO N.V.) 13 June 1990 cited in the application see page 3, line 45-47 see page 4, line 28 - page 5, line 2; examples A,B,C,E ---	1-14
Y	WO-A-94 03562 (HENKEL KGAA) 17 February 1994 see page 10, line 20-27 see page 11, line 8-23; claim 6 ---	1-14
Y	EP-A-0 384 282 (HENKEL KGAA) 29 August 1990 see page 3, line 51-55 see page 5, line 1-10; examples 1,5 --- -/--	1-14

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 June 1995	14.07.95

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016	Kazemi, P

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO-A-92 13049 (ECOLAB INC) 6 August 1992 cited in the application see page 11, line 26 - page 12, line 16; example 1	1-14
A	WO-A-91 18943 (DIVERSEY CORP) 12 December 1991 cited in the application see page 16; table 1 see examples 45-47	1,3-5,7, 10-14
A	US-A-4 604 220 (STANTON J H) 5 August 1986	1,6,7,10
A	EP-A-0 533 552 (CFPI CIE FR PROD IND SA) 24 March 1993	

INTERNATIONAL SEARCH REPORT

Inter. Application No PCT/CA 95/00156

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0372628	13-06-90	AU-B-	623952	28-05-92
		AU-A-	4589689	07-06-90
		CA-A,C	2004544	05-06-90
		EP-A-	0538916	28-04-93
		HK-A-	5995	20-01-95
		JP-A-	2194096	31-07-90
		JP-B-	7035516	19-04-95
		US-A-	5062978	05-11-91
WO-A-9403562	17-02-94	AU-B-	4702693	03-03-94
		CA-A-	2141811	17-02-94
		EP-A-	0652927	17-05-95
		FI-A-	950437	01-02-95
		NO-A-	944100	27-10-94
EP-A-0384282	29-08-90	DE-A-	3905548	06-09-90
		AT-T-	120481	15-04-95
		AU-B-	624920	25-06-92
		AU-A-	5091990	26-09-90
		DE-D-	59008782	04-05-95
		WO-A-	9010053	07-09-90
		EP-A-	0593420	27-04-94
		ES-T-	2069612	16-05-95
		JP-T-	4503685	02-07-92
WO-A-9213049	06-08-92	US-A-	5174914	29-12-92
		AU-B-	653764	13-10-94
		AU-A-	9057991	27-08-92
		EP-A-	0567468	03-11-93
		JP-T-	6503116	07-04-94
WO-A-9118943	12-12-91	US-A-	5073280	17-12-91
		AU-B-	651351	21-07-94
		AU-A-	7975791	31-12-91
		EP-A-	0486656	27-05-92
		US-A-	5223162	29-06-93
US-A-4604220	05-08-86	CA-A-	1249577	31-01-89
EP-A-0533552	24-03-93	FR-A-	2681312	19-03-93